Jl S. Afr. Bot. 44 (2): 157–185 (1978)

SOME PROBLEMS OF SOUTH AFRICAN PTERIDOPHYTA

W. B. G. JACOBSEN

ABSTRACT

A number of South African Pteridophyta are discussed with the object to point out a few taxonomical, nomenclatural and distributional problems in the existing literature.

UITTREKSEL

SOMMIGE PROBLEME MET SUID-AFRIKAANSE PTERIDOPHYTA

'n Aantal Suid-Afrikaanse Pteridophyta word bespreek met die doel om 'n paar taksonomiese, nomenklatoriese en verspreidingsprobleme in bestaande literatuur aan te toon.

INTRODUCTION

The *Lycopodium gnidioides* complex is found to contain three different forms. A study of original description and type as well as experimental cultivation is called for to decide whether form 1 or form 3 have to be put on to subspecific or varietal level or are merely ecotypes. Form 2 appears to be identifiable with *L. gnidioides* L.f. var. *pinifolium* (Kaulf.) Pappe & Rawson.

Two separate forms of *Asplenium erectum* Bory ex Willd. are recognised and described and again it is suggested to embark on a study of types and experimental cultivation to solve the problem of eventual varietal status of one or the other.

An attempt is made to straighten out a certain amount of confusion with regard to the Southern African species of the genus *Polystichum*. Six species are discussed, of which one is described as a new species. A key to the six species is provided to facilitate identification in the field and in herbaria. The distribution of *P. setiferum* var. *fuscopaleaceum* sensu Schelpe is found to extend far into South Africa. Montane forms of this species and of *P. pungens* sensu Sim are described.

The *Dryopteris inaequalis* complex is found to contain two well distinguished forms, a large one with triangular fronds and distinct asymmetry of the basal pinnae (the common forest form) and a small fern with elliptical fronds and symmetrical basal pinnae. The forms have been kept separate under two specific epithets in the past, but were combined by Schelpe (1970) under the name *D. inaequalis* (Schlechtend.) Kuntze. It is suggested to separate the two forms again and to clarify their nomenclature and status.

A form of *Athyrium scandicinum* with a well developed caudex from the Eastern Transvaal is described. The unusual development of a caudex is ascribed to climatic conditions.

Accepted for publication 10th November, 1977.

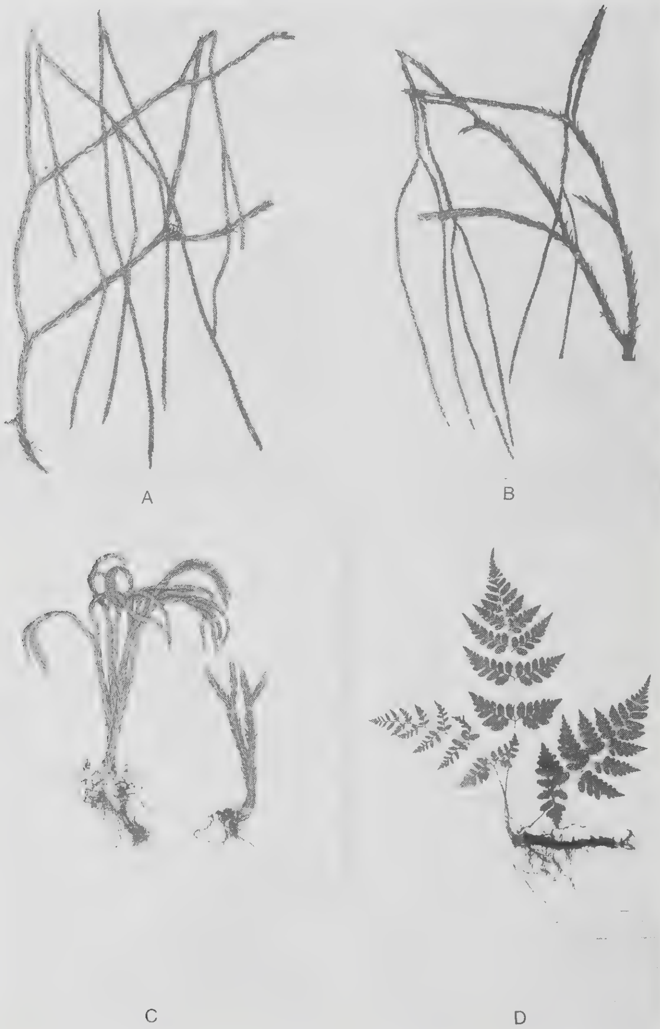


FIG. 1.

A, *Lycopodium gnidioides* L.f. Form 1 Note the closely adpressed, rigid leaves and the long, fairly thick fertile spikes. Erasmus Kop, Eastern Transvaal, *Jacobsen 4391*; B, *Lycopodium gnidioides* L.f. Form 3 Note the slightly patent leaves and the long fertile spikes which are thinner than those of Figure A. Pirie Forest, Eastern Cape, *Jacobsen 4582*; C, *Lycopodium gnidioides* L.f. var. *pinifolium* (Kaulf.) Pappe & Rawson. Pilgrims Hill, Eastern Transvaal, *D. Mousse 52*; D, *Dryopteris inaequalis* (Schlechtend.) Kuntze? Note the thick, creeping rhizome, the elliptical-lanceolate shape of the frond and the slightly reduced, symmetrical basal pinnae. Hogsback Forest, Eastern Cape, *Jacobsen 4576*.

DISCUSSION

The Lycopodium gnidioides *Complex*

Lycopodium gnidioides is extremely variable in Southern Africa and attempts have been made at various times to subdivide it into several species or varieties. The author after studying his own material as well as that in the National Herbarium, Pretoria, found that there are three rather distinct forms which are illustrated on Fig. 1 A, B and C.

Form 1 coincides with Sim's (1915) plate 177 and is characterised by its pendant, rigid, yellow-green branches, which are often fertile to one half of their length of 300–800 mm. The leaves are tightly adpressed. The fertile spikes are 3–4 mm thick, the sporophylls are lanceolate, acute and keeled. A typical representative is shown on Fig. 1, A.

Form 2 compares in habitus with *Huperzia stricta* (Bak.) Tard. as illustrated in *Flore de Madagascar et des Comores*, 1971, Fig. IV, 5–8, and is characterised by its erect, rigid, yellow-green branches, with fertile spikes of only 50 mm length and 3–4 mm thickness. The maximum total height is 300 mm. The fertile spike is often pendulous. The leaves are closely adpressed, the sporophylls ovate, shortly acute and keeled. (See Fig. 1, C).

Form 3 has pendant, herbaceous, dark green branches, 400–800 mm long of which the fertile spike may take up one third at only 2–3 mm thickness. The leaves are loosely adpressed or somewhat patent, the sporophylls are lanceolate, acute, not keeled and slightly reflexed at the tips (Fig. 1, B).

In view of the rather confusing evidence in the pertaining literature a more detailed discussion of the species seems warranted. The species has been known for a long time and its first description originates from the younger Linnaeus in his *Supplementum*, p. 448 of 1781 on material collected by Sonnerat in Mauritius, with long branches, so that it would be representative of either form 1 or 3 above. From then on the species appears in the literature under a number of names. The first mention of the variable habitus of the species was made by Schlechtendal (1825–1832) writing that the plant may be either rigid and compressed or lax and diffuse and that the colour of the dried plants may be green or yellowish-green. His illustration (tab. 2) shows a pendant plant with fairly lax habitus and elongated, fertile spikes. Sim (1915) also depicts on Plate 177 a fairly lax plant with long fertile spikes and a similar illustration is brought by Tardieu-Blot (1971) for *L. gnidioides* on Fig. V, 12. It appears therefore fairly well established that the species in its original concept is generally accepted to be a fairly long, pendant plant, with elongated fertile spikes, growing as epiphyte or chasmophyte in shady forests.

Form 2

There is in South Africa and in the Malagassy Republic a stout, short, erect form, with short, pendulous, quadrangular fertile spikes, which grows in full sunlight on rocks on mountain tops or in streambeds, which although similar to *L. gnidioides* in its typical form is entirely different in habitus (Fig. 1, C). A plant of this type was described by Kaulfuss (*Enum.fil. Chamisso*, p. 7, 1824) as *Lycopodium pinifolium*, which had strobili of 1½–2 inches length. This species was reduced by Pappe & Rawson in 1858 to a variety of *L. gnidioides*, of which they give the following description:

''Leaves densely imbricate, coriaceous, decurrent, glossy, spikes two inches long, sessile, standing in pairs, branches dichotomous, fastigiate, curved at the apex, bracts keeled. Stem erect, 10–12 inches high.''

This description corresponds in every detail with the mountain top form. In 1882 Baker described a similar plant from mountains in Madagascar as *Lycopodium strictum* and distinguishes this species from *L. gnidioides* as follows:

L. strictum: ''Stems tufted, erect, poorly branched, 15–30 cm long, with the leaves 6–9 mm in diameter, leaves oblong or linear oblong, obtuse, ascending, imbricate and densely crowded, thick and rigid in texture, 6–9 mm long, midrib obscure. Spikes pendulous, single, 2½–4½ mm in diameter, bracts broadly ovate, very thick, closely imbricate, 1¾–2¼ mm long.''

L. gnidioides: ''Stems pendulous, 30–60 cm or more long, several times dichotomously forked, with the leaves 12,5 mm in diameter. Leaves oblong-lanceolate, moderately dense, ascending, obtuse, thick in texture, glossy 9–12,5 mm long, midrib distinct. Sporangia in lax spikes, which are often 15 cm long, in the axils of thick ovate-oblong bracts, 3½–4½ mm long.''

Following the recent practice of splitting the family Lycopodiaceae into two subfamilies Lycopodiaceae s.s. and Huperziaeceae (Rothm., Repert. Sp. Nov. **66:** 236, 1962). Tardieu-Blot in Adansonia ser. 2, **10:** 20 (1970) accepts Baker's *L. strictum* under the new combination *Huperzia stricta* (Bak.) Tard., but in 1971 (*Fl. de Madagascar et des Comores*, p. 30) considers *Lycopodium pinifolium* Klf. as synonymous with *Huperzia gnidioides* (L.f.) Trev. On Fig. IV, 5–8 (p. 31) she illustrates *Huperzia stricta*. The deviating habitus of the species agrees in the main with a number of the author's own specimens as well as with many sheets at PRE (Fig. 1, C). There is, however, some disagreement between recorded measurements of leaves and sporophylls between Tardieu-Blot, Schelpe (in a personal communication to Mr P. Vorster of the Botanical Research Institute, Pretoria) and the author as the following tabulation shows:

	Tardieu-Blot	Schelpe	Author
Leaves:			
Length mm	6–8	8–10	12–13
Width mm	1,5	2,5–3	1,75–2
Sporophylls:			
Length mm	2	2,5	4
Width mm	2	2	2,75

Schelpe found slightly smaller dimensions in the Malagassy material than in the South African forms, but there is a rather formidable difference between his figures and the author's, whose specimens originate mainly from the Eastern Transvaal.

Leaving the general acceptance of the subdivision of the Lycopodiaceae and of the genus *Lycopodium* to be settled by taxonomists and adhering for the time being to the concept of the genus *Lycopodium* sensu lato the question arises whether the form 2 should be maintained as a separate species, should be put on to subspecific or varietal level or as Schelpe (1970) has done, should be combined with *L. gnidioides*. Morphological differences between it and what is generally considered to be *L. gnidioides* are slight, the forest plant usually having slightly larger leaf dimensions. But the decisive factor appears to be the totally different habitus, which may, of course, be due merely to an adaptation to different ecological conditions, in which instance the plant would have to be classed as an ecotype of *L. gnidioides*. Transitions to the forest forms, however, seem to be lacking, so that the author is inclined to propose acceptance as a variety of *L. gnidioides*, a view, which Schelpe seems to support—at least for the Malagassy plant. Kaulfuss' *L. pinifolium*, which was reduced by Pappe & Rawson to *L. gnidioides* var. *pinifolia* was based on a type from South Africa. This varietal epithet has preference before Baker's epithet *''strictum''*. The author proposes, therefore, to reinstitute the name *Lycopodium gnidioides* L.f. var. *pinifolium* (Kaulf.) Pappe & Rawson for this plant.

Further specimens of this variety in the examined herbaria are:

Author: Mount Sheba Nature Reserve, *Jacobsen 4449*; Ohrigstad Nature Reserve, *N. Jacobsen 4242;* Elandshoogte Plantations, *Jacobsen 4772*.

PRE—Blauwberg, Cape, *Leeman 108*; Koegelberg, Cape, *v.d. Merwe s.n.*, Table Mountain, Cape, *Esterhuyzen 15633*; Port Edward, *Strey 8646*; Port Edward, Umtamvuma River, *Nicholson s.n.*; Lusikisiki, *Marais 967*; Kaapsche Hoop, *Wager 85*; Kaapsche Hoop, *Pole-Evans s.n.*; Swaziland, *Compton 26005*; Pilgrims Rest, *Mousse 52*; Mariepskop, *van Son 1751c*; Mariepskop, *Killick & Strey 2389*; Mariepskop, *Meeuse 9862*; Mariepskop, *v.d. Schijff s.n.*; Chimanimani, Rhodesia, 6 000 ft, *Thompson s.n.*; Chimanimani, 5 600 ft, *Mitchell 270*; PRE *2697*, sine loc. (very typical).

Forms 1 and 3

While a separation of form 2 from *L. gnidioides* has also been proposed by previous workers, the long stemmed forest form has so far always been considered as a uniform species. As mentioned in the introduction there are, however, two distinct forms. Which of the two represents the typical *L. gnidioides*? Is it the rigid, yellow-green form 1 (Fig. 1, A) or the herbaceous form 3 (Fig. 1, B)? The latter is in some ways similar to the illustration of *L. ophioglossoides* by Schelpe (1970, Table 3) and was initially mistaken for this species by the author. *Marriott 4878* at PRE was likewise misidentified as this species. Only on comparison with other well authenticated *L. ophioglossoides* at PRE was the difference clearly revealed. The tendency to misidentify the plant indicates that we have here a much frailer form than the stiffly rigid, yellow-green form. Apart from the strong differences in habitus, some observations and measurements show slight differences between the two forms:

	Form 1	Form 3
Leaves:		
Shape	lanceolate	linear-oblong
Tip	acute	rounded
Margin	slightly inrolled	not inrolled
Length mm	12–13	9–15
Width mm	1,5–2,5	2,25–2,5
Sporophylls:		
Spike	3–4 mm diameter	2–3 mm diameter
Shape	ovate-lanceolate	broadly ovate
Tip	acute	acute
Length mm	4–5	2–3,25
Width mm	2	1,75–2
Keel	present	absent

As with *L. gnidioides* var. *pinifolium* the morphological differences could be considered too slight to warrant separation and again the difference in habitus is the decisive factor. The frailer plant cannot be considered as an ecotype as the habitats are the same for both forms. It seems, however, that the rigid form is confined to higher altitudes than the frailer form. A final decision whether the two forms are merely ecotypes cannot be reached at this stage, but could possibly result from experimental cultivation from stem tip cuttings in an atmosphere of high humidity. Such experiments are unfortunately out of reach to the author.

A geographical separation does not seem to exist as specimens of both forms in the author's collection and at PRE originate from a wide range of localities, from the forests of the south-western Cape, through the Ciskei, Transkei, Natal into the eastern Transvaal and from there into tropical Africa.

The following localities for the two forms can be cited:

Form 1:

Author: Erasmus Kop, Transvaal, *Jacobsen 4391*.

PRE—Hottentots Holland Mountains, *Stokoe 1653*; Nkandla, *Acocks 11804*; Graskop, Eastern Transvaal, *Strey s.n.*; Erasmus Kop, Eastern Transvaal, *Hardcastle 14*; Boshoff Road, *Hill 1629c*; Haenertsburg, *Sim*, PRE *4331*; Blaauwberg, Transvaal, *Dyer 9223*; Kenya, *Maas Geesteranus 5422*; Lake Kivu, Congo, *Humbert 7488*; sine loc., *v.d. Schijff 7361*.

Form 2:

Author: Pirie Forest, Eastern Cape, *Jacobsen 4582*; Hogsback Forest, *Jacobsen 4559*; *4560*; Nkandhla, *Jacobsen 4344*; Pilgrims Rest, *Jacobsen 4598*.

PRE—Knysna, *Bottomley s.n.*; Caledon, *Pillans 6342*; Table Mountain, *Marloth 6930*; Pirie Forest, *Sim 1439, 750, 665c, 666c*; Port St. Johns, *Mogg 4667*; Port St. Johns, *McLoughlin 7656*; Port Shepstone, *Strey 5824*; Uvongo, *Strey 821*; Swart Umfolosi, *Codd 1561*; Natal Drakensberg, *Marriott 4878*; Kranskop, *Strey 4243*; Pilgrims Rest, *v.d. Schijff 6307*; Pisanghoek, Transvaal, *Bosman 3957*; Vulcan Karisimbi, Congo, *Jean Louis 5433*; Reunion, *Schlieben 10867*.

To assist field observations a key for the subdivision of the three forms is supplied.

Stems erect, spikes occasionally
    pendulous at the tips ....Form 2
L. gnidioides L.f.
var. **pinifolium** (Kaulf.)
Pappe & Rawson

Stems pendant
    Leaves rigid, coriaceous, adpressed, plant drying yellow-green ....Form 1
    Leaves soft, herbaceous, slightly patent, plant drying dark green ....Form 3

Asplenium erectum Bory ex Willd.

Some confusion with regard to this species is encountered in the existing literature. It appears as if two rather different forms are described by the same name. Schlechtendal (1825–1832, p. 28, t.15) depicts under this name a fern with fairly large, oblong, falcate, acute, serrate pinnae, but mentions in his description and discussion of the species that there are two forms, one with large pinnae as illustrated, the other with much smaller pinnae, which he interprets as merely immature specimens as transitions exist.

Pappe & Rawson (1858) describe the species as having shortly stalked, lanceolate, sub-falcate, acuminate, bluntly serrate pinnae and refer to Schlechtendal's figure.

Since 1900 descriptions and illustrations of *Asplenium erectum* have been published by Sim, p. 145, t.48 (1915), Tardieu-Blot, p. 219, Fig. XXX, 1–3 (1958) and Schelpe, p. 175, t.53, var. *usambarense* (1970). Sim places the species into the much-varied *Asplenium lunulatum* complex as var. *erectum* (Bory) Sim, while the other two authors refer to it under the name *Asplenium erectum* Bory and *A. erectum* Bory ex Willd. respectively. While Sim's illustration, however, clearly resembles that of Schlechtendal, Tardieu-Blot and Schelpe show a small fern, with small, oblong, rounded, serrate pinnae, quite different from Schlechtendal's and Sim's figures. Schelpe (1967) discusses the variety *usambarense* and finds that the type material from the Mascarene Islands is intermediate between the tropical African var. *usambarense* and the South African plants referred by Sim and others to *A. erectum*. He agrees that a new evaluation of specific and subspecific concepts will have to be done.

When studying collected own material, as also herbarium material at PRE and at the University of Pretoria it was found that there are indeed two well separated forms which in spite of many common features, such as rhizome, the green-winged margins of the greenish-grey rhachis, descrescent pinnae a.o., show considerable differences in total length of frond, as well as in the size and shape of pinnae as the following tabulation demonstrates:

No. of spec. Jacobsen	Length of lamina mm	Length of mid. pinnae mm	Width of mid. pinnae mm	Tip	Origin
3036	300	13	5	round	Vumba
3898	290–350	15–17,5	6–7	round	Chirinda
3124	220	16	6	round	Chirinda
4353	270	12	5	round	Nkandhla
4284	180–190	13–14	4–5	round	Port St Johns
2339	220	16–18	5	acute	Tsitsikamma
4541	440	28–35	9	acuminate	Hogsback
4533	300	23	9	acute	Hogsback
4566	420	42–43	8	acuminate	Hogsback
4452	400	38–40	10	acuminate	Pilgr. Rest
4456	395	38	10	acuminate	Pilgr. Rest
4386	590	32–35	9	acuminate	Pilgr. Rest
4589	585	38–40	10	acuminate	Zoutpansbg.

The difference is also clearly demonstrated on Fig 2, A and B, showing *Jacobsen 4456* from the Mount Sheba Nature Reserve, Eastern Transvaal with acuminate pinnae of up to 38 mm length and *Jacobsen 4284* from Port St Johns with rounded to sub-acute pinnae of up to 14 mm length. The longly pinnate form from Hogsback agrees closely with Sim's drawing, t.48

With regard to the length of the fronds Tardieu-Blot seems to have included both forms in her description (200–600 mm), which in turn would explain her inclusion of Sim's illustration into the synonyms although there is a sharp contrast

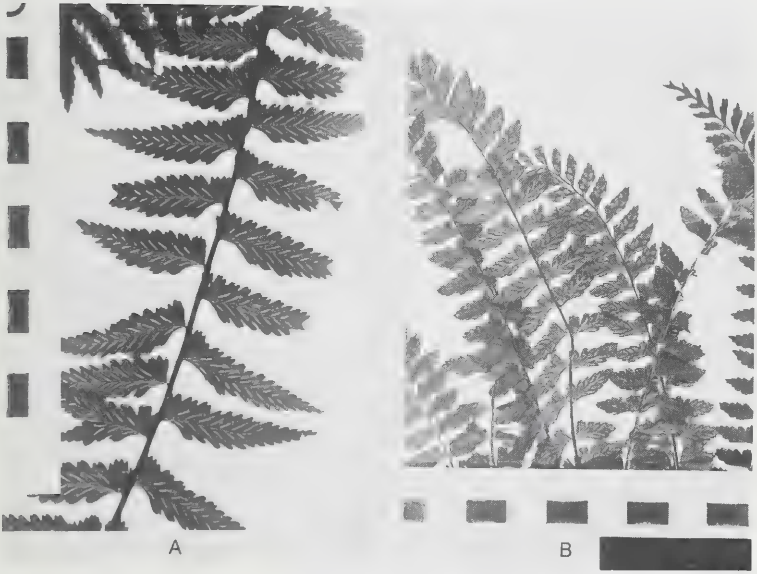


FIG. 2.
A, *Asplenium erectum* Bory ex Willd. Large-pinna form, Pilgrims Rest District, Eastern Transvaal, Mount Sheba Nature Reserve, *Jacobsen 4456*. Scale in cm; B, *Asplenium erectum* Bory ex Willd. Small-pinna form, Mlolweni Forest, Port St. Johns, *Jacobsen 4284*. Scale in cm.

to her own illustration. It would be interesting to know whether intermediate types occur in Malagassy which seem to be lacking in South Africa.

A distributional separation in South Africa does not exist as both forms have been found in the Woodbush of the eastern Transvaal and in areas as close together as Nkandhla and Qudeni or George and Tsitsikamma.

In view of many common features it seems that both forms should be left in the *Asplenium erectum* complex, but that studies of the original descriptions and types as well as experimental cultivation should be done to reveal whether transitions exist or whether the placing of one or the other of the two forms on to varietal level is justified.

The Genus Polystichum *Roth*

The following notes should not be considered as an attempt to revise the Southern African species of this notoriously difficult genus, but are designed to help in the understanding and distinction of the various species in Southern Africa. They are based on field and herbarium observations. A key to the presently distinguishable species using simple morphological features is designed, which includes three clear cut and well authenticated species, two species referred to as sensu their particular authors and one new species.

In the latter instances the question of correct names may ultimately depend on a further study of types and even then the final answer on these difficult and often hybridising species will require cytotaxonomical studies and spore investigations as well as possibly experimental cultivation.

It is felt, however, that pending the conclusion of such detailed studies, the provided key will be of use to separate the various members of the genus in the field. The species as defined are discussed with regard to their salient features and their distribution. The pinnules of the latter three species vary much in size and shape within fairly wide limits and some of these variations are shown on Figures 7, 8 and 9.

KEY TO SPECIES

1 Frond pinnate .... **P. macleaii** (Bak.) Diels
1′ Frond two-pinnate to three-pinnatifid ....
  2 Rhizome, stipe and rhachis scales black ..... **P. luctuosum** (Kunze) Moore
  2′ Rhizome, stipe and rhachis scales brown ....
    3 Sori practically exindusiate or indusia evanescent at a very early stage ....
      4 Pinnule margins bluntly crenate .... **P. zambesiacum** Schelpe
      4′ Pinnule margins sharply serrate, acute, mucronate or aristate .... **P. transkeiense** Jacobsen
    3′ Sori with more persistent indusia ....
      4 Sori reddish-brown, Indusia yellowish, flat, disc shaped plant usually densely set with foxy-red scales, drying green .... **P. setiferum var. fuscopaleaceum** sensu Schelpe
      4′ Sori brown, indusia light to dark brown with dark centre, funnel-shaped, plant often set with pale brown scales, plant drying black on upper side and silver to olive-grey on under side .... **P. pungens** sensu Sim

DISCUSSION OF SPECIES

Polystichum macleaii (Bak.) Diels in Nat. Pfl. I, 190 (1899) (wrongly spelt Macleanii); Sim, Ferns S. Afr. 2. ed., 120, t.31 (1915).

Aspidium Macleaii sensu Sim, Ferns of S. Afr. 1. ed., 170 (1892).

This fern with its pinnate, hard, leathery fronds and sharply serrate pinnae is a precise type and offers no problems in South Africa. Sim quotes it from the Transkei (Bazija). The author has seen it mainly in a number of places in the Eastern Transvaal. It has so far not been found further north and is not mentioned in *Flora Zambesiaca*.

Polystichum luctuosum (Kunze) Moore, Ind. Fil.: 95 (1858); Sim, Ferns S. Afr. 2. ed. 117, t.28 (1915); Tardieu, Fl. Madag. Polypod. 1; 320, t.45, Fig. 9–12 (1958); Schelpe, Fl. Zamb. Pterid. 228, t.64, Fig. C (1970).

This is also a well defined and easily recognisable species with its characteristic coat of black to dark brown rhizome, stipe and rhachis scales, the longly tapering apex of the frond (see Fig. 3, A and B), the often falcate pinnae and the oblique and costa-decurrent pinnules.

Its distribution ranges from the Eastern Cape through the Transkei and Natal into the Eastern Transvaal and into Rhodesia, where it is rare. It is also known from Madagascar. It is always confined to deep shade in forests, often growing in ravines or near streams and is on the whole not common.

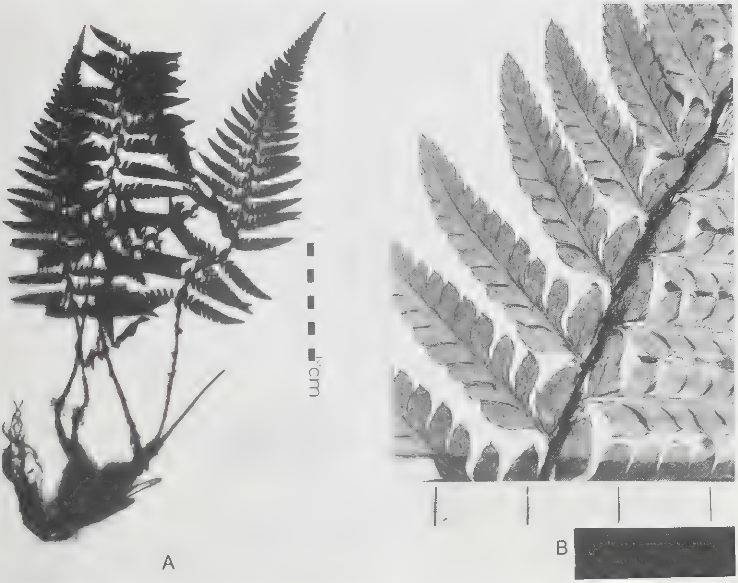


FIG. 3.
A, *Polystichum luctuosum* (Kunze) Moore. Habitus, showing the ovate-lanceolate, attenuate fronds. Blyde River Forest Reserve, Pilgrims Rest District, Eastern Transvaal, *Jacobsen 4365*. Scale in cm; B, *Polystichum luctuosum* (Kunze) Moore. Centre of lamina. Note the characteristic black scales on the rhachis and the acroscopically enlarged basal pinnules. Blyde River Forest Reserve, Pilgrims Rest District, Eastern Transvaal, *Jacobsen 4356*. Scale in cm.

Polystichum zambesiacum Schelpe in Bol. Soc. Brot., Ser. 2, **41:** 215 (1967); Schelpe, Fl. Zamb. Pterid.: 226, t.64, Fig. A (1970).

This fern, only recently described from Rhodesia, is well characterised by its usually fairly dissected, lobate pinnules with bluntly crenate margins, which separate this species clearly from the following three species, which all have sharply serrate or aristate pinnule margins (Figs 7–9). To Schelpe's clear description the author would like to add some observations on dried material. All specimens seen dried almost black on the dorsal and dull olive green on the ventral side with slightly darker veins and a slightly chagrined surface. Indusia are obviously evanescent at a very early stage, as they were seen only in one specimen, where they were of half the size of the sorus.

The pinnules vary from almost undivided to pinnatifid (compare Schelpe's illustration in *Flora Zambesiaca*, Table 64, Fig. A_2), are usually triangular with rounded to acute apices, the margins bluntly serrate. The rhachis is fairly thin and slightly flexuous with few brown scales, which also may occur on the costae (Fig. 4, A).

Initially there seems to have been some notion that this species was synonymous with *P. ammifolium* Poir. Encycle. **5:** 554 (1804) (Schelpe, 1969), although this author (1967) in his annotations to the description of the new species maintains that *P. ammifolium* is apparently endemic to Mauritius. Still earlier Alston & Schelpe (1952), however, regard *P. aculeatum* sensu Sim as synonymous with *P. ammifolium*. Sim's illustration of *P. aculeatum* (t.26), which with its heavy cloth of hair-like scales and its pinnules set at right angles to the costa corresponds best with *P. setiferum* var. *fuscopaleaceum* sensu Schelpe 1970: 226, however, seems to point to the synonymy of the latter two species. Schelpe (1970) accordingly does not quote any synonyms and concludes that the distribution of *P.*

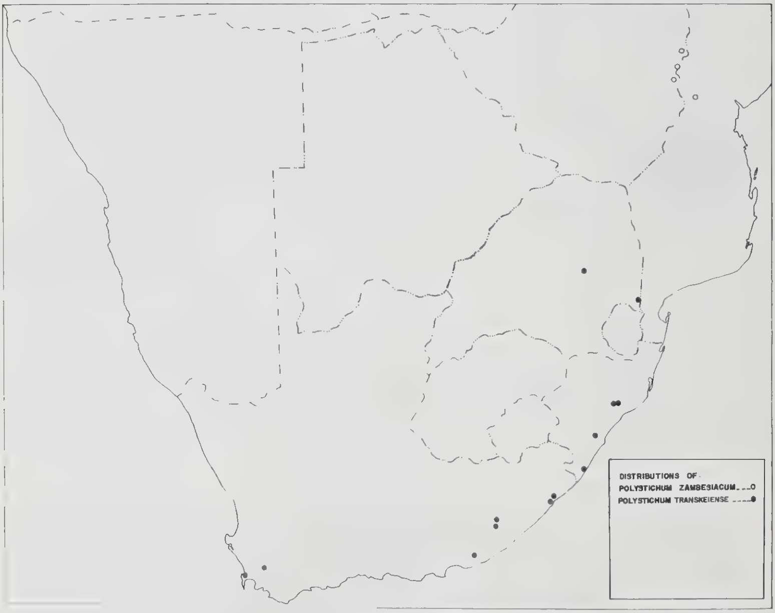


FIG. 10.
Distributions of *Polystichum zambesiacum* and *Polystichum transkeiense*.

zambesiacum is confined to Rhodesia, Malawi and Mozambique. As Fig. 10 shows the species does not occur south of 20° latitude and is separated by a wide distributional gap from the somewhat similar new species *P. transkeiense* as will be discussed below.

The fern is represented in the examined collections by the following specimens:

Author: Imbeza Forest, Penhalonga, Rhodesia, *Jacobsen 3838, 3838a;* Vumba Mountains, Rhodesia, *Jacobsen 3033, 1454, 3037;* Inyanga, Rhodesia, *Jacobsen 3812.*

PRE—Vumba Mountains, *Chase 1102;* Pungwe, *Schweickerdt 2412.*

Whereas the previous three species are well defined and easily recognisable, with only moderate variations in the size and shape of the pinnules, the following three species are sometimes difficult to separate and show great variations in shape and size of pinnules, as Figs 7–9 demonstrate. It is only by extensive studies of herbarium material that the author can now claim to be able to distinguish between the various species in most instances. Least affected by variations is *P. setiferum* var. *fuscopaleaceum* sensu Schelpe which on account of its persistent bright green colour in dried specimens and the abundance of foxy-red to light-brown scales on rhizome, stipe, rhachis and costae is rather easily recognised. The new species *P. transkeiense* usually dries green, but does turn dark on occasions. *P. pungens* sensu Sim always dries black or dark olive green on the upper side and silver grey to light olive green on the under side.

Polystichum transkeiense Jacobsen sp. nov.

Rhizoma elongata repens, paleis pallide vel atro-brunnescentis acuminatis vel caudatis leviter dentatis obsitis. Frondes caespitosi arcuati herbacei. Stipes usque ad 580 mm longus, viridis vel rariter pallide fuscus, glabrus vel ad basim paleis dispersis lanceolatis acuminatis usque ad 13 mm longis obsitis. Lamina 480 mm usque ad maxima 650 mm longa et 300 mm lata, in ambitu ovata acuta, pinnis basalis aliquantum reductis et deflexis bi-pinnatis et leviter vel profunde tripinnatifida. Pinnae anguste oblongae, usque ad 240 mm longae et 60 mm latae ad apicem longe attenuatae et caudatae. Pinnulae petiolatae in ambitu ellipticae vel obliquo-triangulares late acutae, ad basim inaequaliter cuneatae glabrae leviter vel profunde pinnatifidae, lobis serratis acutis vel aristatis, lobo acroscopico basale maximo. Rhachis straminea vel viride tenua flexuosa paleis longis fimbriatis fusci-castaneis ad basim pinnae concentratis. Sori circulares, c. 1 mm diam., indusium evanidum. Sporangia annulis castaneis transversis striatis et paraphysis atris ad apicem cellulis albis translucentis praeditae.

Type: TRANSKEI, (Port St. Johns): 67 m, *Jacobsen 4301* (PRE).

Also from the following localities:

Author: Mount Sheba Nature Reserve, *Jacobsen 4454;* Qudeni, *Jacobsen 4460;* Nkandhla, *Jacobsen 4355;* Port St. Johns, *Jacobsen 4322;* Hogsback, *Jacobsen 4546*.

PRE—Komati Poort, *Muller 2107;* Qudeni, *Fischer 802;* Buccleuch, Natal, *Sim 3641;* Port Shepstone, *Strey 5994;* Port St. Johns, *Wilkins 40;* Port St. Johns, *Flanagan 2473;* Port St. Johns, *McLoughlin 5/36;* Egossa Forest, *Strey 8869;* Lusikisiki, *Strey 6718;* Visch River, *Zeyher*, coll. *Sim 524c;* Worcester District, *Cooper 1736;* Table Mountain, Cape Town, *Marloth 6936*.

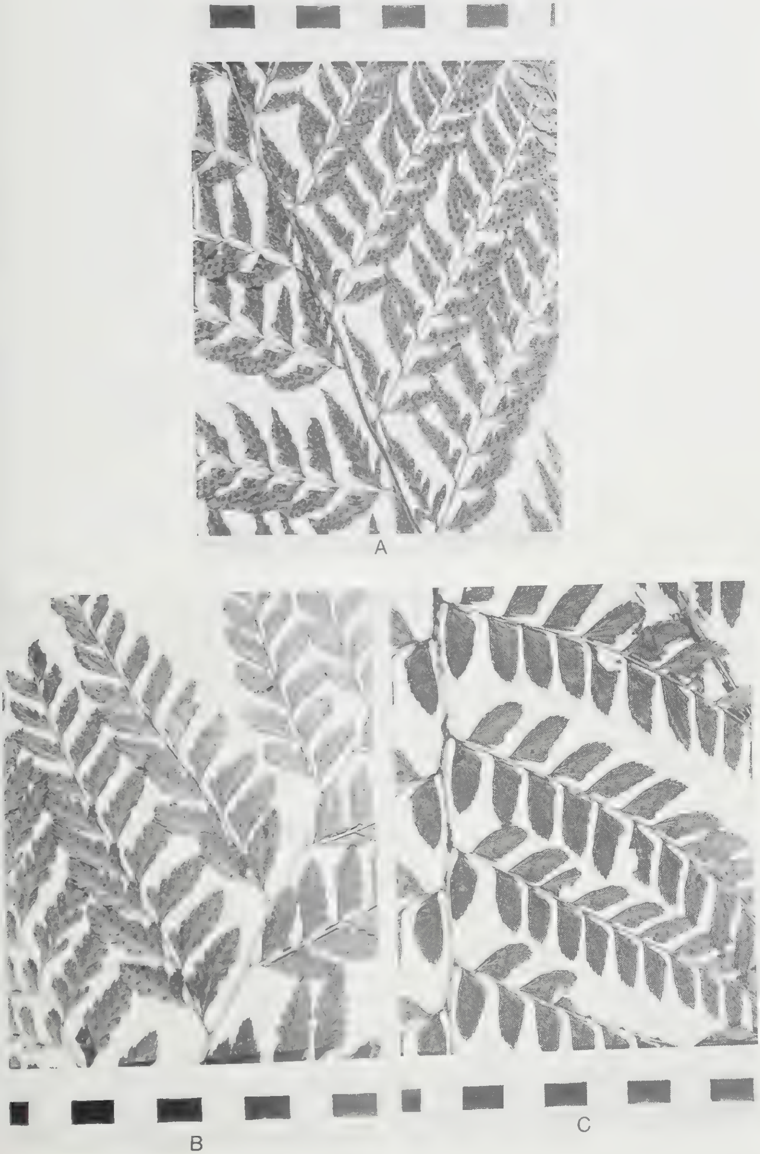
The fern is distinguished from *P. pungens* sensu Sim by its practically exindusiate nature, the softly herbaceous character and its tendency to grow isolated in deep shade and not in large clusters in less shaded positions as is the case with *P. pungens*. From *P. setiferum* var. *fuscopaleaceum* sensu Schelpe it is separated by the scarcity of brown scales, sometimes being practically glabrous and its flexuous thin rhachis (Fig. 4, B and C). From *P. zambesiacum* Schelpe, which the fern resembles most, it is clearly distinguished by the sharply serrate and usually distinctly aristate or at least mucronate pinnule lobes.

The plant must have been observed by Sim (collected by him at Buccleugh, Natal, under number *3641*, PRE) as it occurs quite frequently in Natal and the Transkei, but it is apparently included in his description of *P. aculeatum*, which judging by his illustration on Plate 26 is representative of what is now known as *P. setiferum* var. *fuscopaleaceum* sensu Schelpe.

There are distinct distributional variations, the Natal and Transkei forms having the largest, least scaly fronds and most subdivided pinnules, while the shape of the pinnules of the Hogsback forms tend to resemble *P. pungens* (Fig. 7). The few specimens from the Transvaal are distinctly more scaly and the pinnules are only faintly lobed (Fig. 4, C). The distribution of the species is so far somewhat disjointed, as there are a few gatherings from the southwestern Cape, then a more or less continuous belt from the eastern Cape through the Transkei into Natal and again a few localities in the eastern Transvaal (Fig. 10). These in turn are separated by a wide gap from the similar *P. zambesiacum* in Rhodesia and Mozambique.

FIG. 4.

A, *Polystichum zambesiacum* Schelpe. Centre of lamina. Note the strongly divided pinnules with rounded lobes and the thin flexuous rhachis. Vumba Mountains, below Castle Mountain, Rhodesia, *Jacobsen 3033*. Scale in cms; B, *Polystichum transkeiense* Jacobsen sp. nov. Centre of lamina. Similar to A, but lobes sharply serrate-aristate. Note the thin, glabrous, flexuous rhachis. Port St. Johns, *Jacobsen 4301*. Scale in cm; C, *Polystichum transkeiense* Jacobsen sp. nov. Centre of lamina. Undivided pinnules of the Transvaal form, but characteristic is the slightly scaly, thin, flexuous rhachis. Mount Sheba Nature Reserve, Pilgrims Rest District, Eastern Transvaal, *Jacobsen 4454*. Scale in cm.


A
B
C

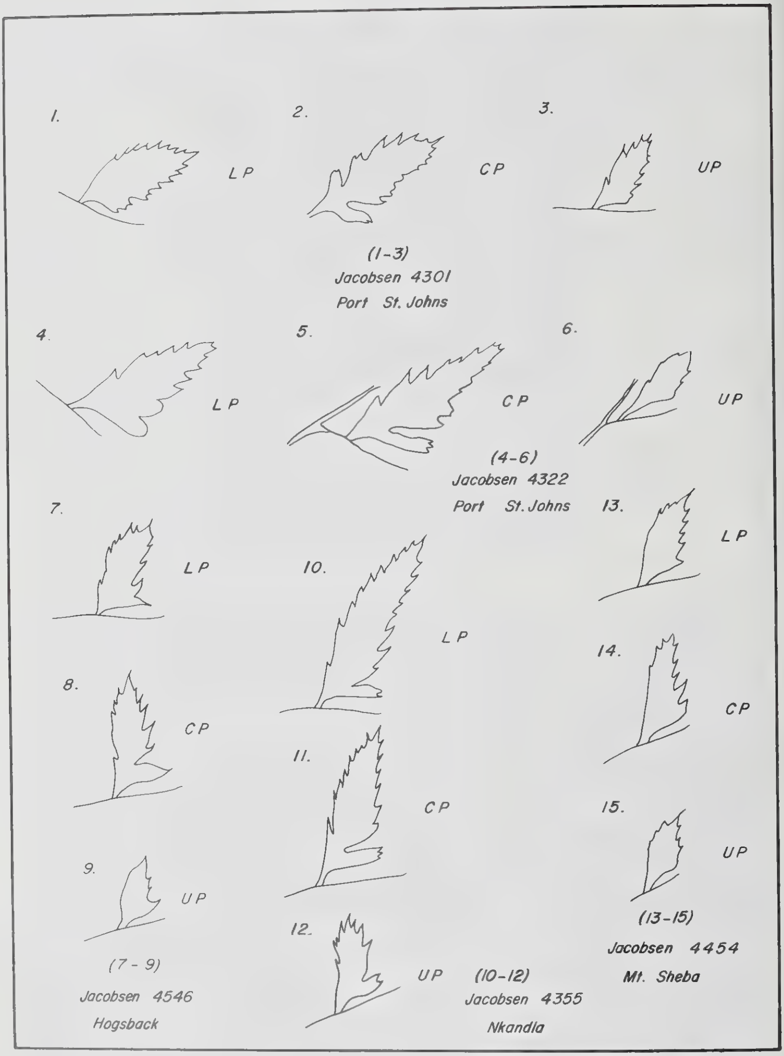


Fig. 7.

Polystichum transkeiense. Variations in size and shape of acroscopic pinnules. Note the sharply serrate and mucronate to aristate character of the pinnule lobes and the strong variations in size of pinnules. Natural size. LP = Lower pinnule, CP = Centre pinnule, UP = Upper pinnule.

Polystichum setiferum var. **fuscopaleaceum** sensu Schelpe in F1. Zamb. Pterid. 226, t.64, Fig. B (1970).

Polystichum aculeatum sensu Sim in Ferns S. Afr. 2.ed., 115, t.26 (1915).

The likelihood of the synonymy of *P. aculeatum* sensu Sim and *P. setiferum* var. *fuscopaleaceum* has been discussed in the foregoing (see under *P. zambesiacum*). The latter name was published by Schelpe as comb. nov. et stat. nov. *P. setiferum* (Forsk.) Moore ex Woynar var. *fuscopaleaceum* (Alston) Schelpe in Bolm. Soc. Broteriana Ser. 2, **41:** 216 (1967). To avoid ambiguity as to the true nature of the species discussed, however, the author has preferred to refer to the species under the above name.

The fern is fairly easily recognised by its usually heavy coat of light-brown to foxy-red scales on rhizome, stipe, rhachises and costae, the almost rectangular setting of the pinnules on the costae and the retention of its green colour when dry. Variation of pinnules in size and shape is not as pronounced as in *P. transkeiense* and *P. pungens* sensu Sim. (Fig. 8).

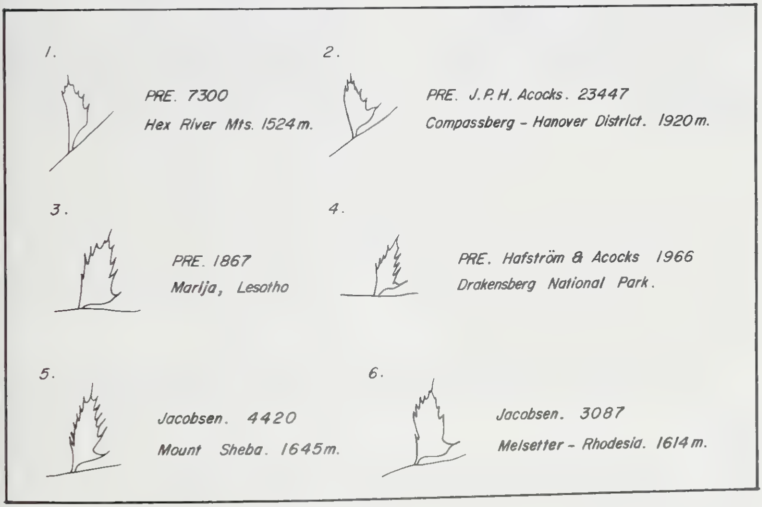

1.
PRE. 7300
Hex River Mts. 1524m.
2.
PRE. J.P.H. Acocks. 23447
Compassberg - Hanover District. 1920m.
3.
PRE. 1867
Marija, Lesotho
4.
PRE. Hafström & Acocks 1966
Drakensberg National Park.
5.
Jacobsen. 4420
Mount Sheba. 1645m.
6.
Jacobsen. 3087
Melsetter - Rhodesia. 1614m.

FIG. 8.

Polystichum setiferum var. *fuscopaleaceum*. Variations in size and shape of central acroscopic pinnules. Note the deviation from the usual 90 ° angle formed between costa and basiscopic side of pinnule in the montane form from the Cape. Natural size. Abbreviations as for Fig. 7.

According to Schelpe (1970) the distribution of the fern is confined to the higher tropical African mountains. A thorough study of the author's material and of material at PRE has extended the range of the species well into the subtropical and even temperate ranges of South Africa, the latter mostly in a slightly diverging montane form. A comparison of A and B on Fig. 5 as well as the following tabulation proves beyond doubt that the tropical form extends into the Eastern Transvaal.

	Jacobsen 3864	*Jacobsen 4485*
Locality	Banti South, Rhodesia	Mount Sheba Nature Reserve, Eastern Transvaal
Altitude	1 870 m	1 935 m
Stipe	brown below, stramineous above	brown below, greenish-stramineous above
Stipe scales	large, oblong-lanceolate, acuminate, dark to light brown, 10 × 3 mm and linear, filiform, smaller, acuminate, light brown	large, oblong-lanceolate, acuminate, dark to light brown, 12 × 3 mm and linear to filiform, smaller acuminate, light brown
Lamina	arching, herbaceous, 500 × 200 mm, oblong lanceolate-acuminate, basal pinnae hardly reduced	herbaceous, 580 × 230 mm, lanceolate, longly acute, basal pinnae hardly reduced
Pinnae	100 × 23 mm, narrowly oblong, attenuate, basal acroscopic pinnules slightly larger	110 × 25 mm, narrowly oblong, acute to attenuate, basal acroscopic pinnules slightly larger
Pinnules	closely spaced, slightly petiolate, up to 12 × 7 mm, cuneate at base, forming a right angle, auriculate acroscopically, oblong, broadly acute, serrate-aristate, glabrous ventrally, softly hairy dorsally	fairly closely spaced, up to 15 × 6 mm, cuneate at base, forming a right angle, auriculate acroscopically, oblong, broadly acute, sharply serrate-aristate, glabrous ventrally, sparsely pilose to glabrous dorsally
Rhachis	stramineous with numerous reddish-brown, lanceolate to filiform scales on rhachis and costae	stramineous, densely set with reddish-brown linear to hair-like scales with laciniate outgrowths at the base, up to 6 mm long on rhachis and costae
Sori	about 1 mm diameter, indusia fallen off due to mature state	about 1 mm diameter, indusia fallen off due to mature state

It is evident that *Jacobsen 3864* agrees with Schelpe's (1970) description and is, therefore, *P. setiferum* var. *fuscopaleaceum*. With the exception of the almost glabrous pinnules and the slightly larger frond *Jacobsen 4485* (Fig. 5, B) agrees well with No. *3864* and must likewise be considered to be the species. Other gatherings from the Transvaal are *Jacobsen 4428*, a more juvenile specimen, also from Mount Sheba Nature Reserve, where the erose indusia are well preserved,

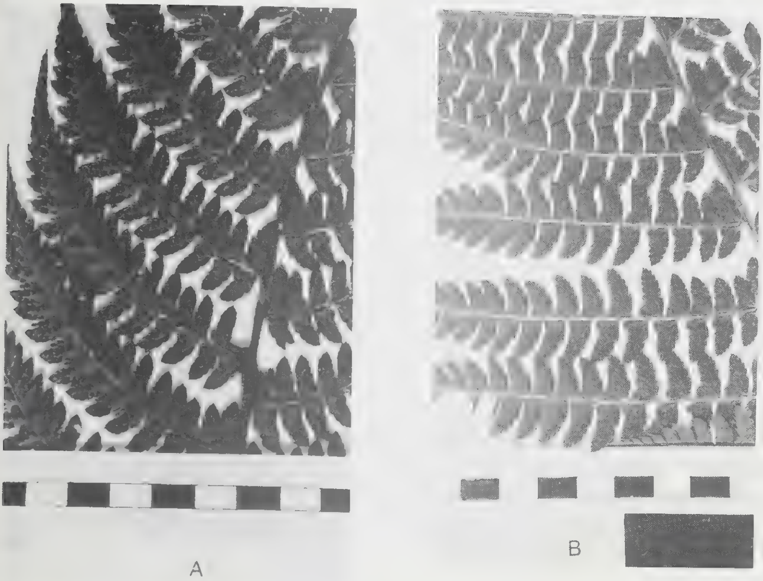


FIG. 5.
A, *Polystichum setiferum* var. *fuscopaleaceum* sensu Schelpe. Centre of lamina. Note the characteristic, almost rectangular setting of the lower edge of the pinnules to the secondary costae. Banti South Endemic Forest, Umtali District, Rhodesia, *Jacobsen 3864*; B, *Polystichum setiferum* var. *fuscopaleaceum* sensu Schelpe. Centre of lamina, showing the typical rectangular setting of the pinnules and the strongly scaly rhachis. Mount Sheba Nature Reserve, Pilgrims Rest District, Eastern Transvaal, *Jacobsen 4485*. Scale in cm.

Jacobsen 4255 from Ohrigstad, *4332* from Maviriestad near Ermelo. *Jacobsen 4298* from Karkloof in Natal finally extends the range of the species into much lower altitudes (610 m) and further south. A study of the Pretoria material showed gatherings from Mount Hope, Upper Zwart Kei River, 1615 m (*Galpin 5621*) and from Hogsback, Eastern Cape Province, probably from an altitude of 1 160 m (*Dahlstrand 2902*). The range of distribution of the typical form of the species is thus extended into the Eastern Cape Province (see Fig. 11) and into far lower altitudes than was known so far.

The following additional localities of the species are:

Author: Melsetter, *Jacobsen 3087*; Banti South, Rhodesia, *Jacobsen 3879*; Mount Sheba Nature Reserve, *Jacobsen 4498* and *4420*.

PRE—Sabi Gorge, *Wager 25*; Barberton, *Wager 151*; sine loc. PRE *746*; Maviriesstad, *Polt 4848*; Northern Transvaal, *Repton 5B*; Woodbush, *Reynolds,*

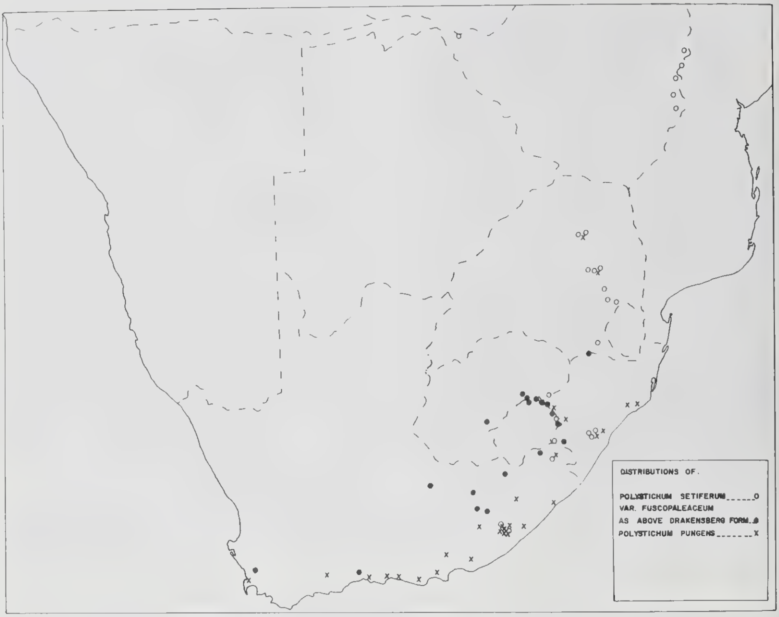

DISTRIBUTIONS OF.
POLYSTICHUM SETIFERUM ______O
VAR. FUSCOPALEACEUM
AS ABOVE DRAKENSBERG FORM. ●
POLYSTICHUM PUNGENS ________X

FIG. 11.
Distributions of *Polystichum setiferum* var. *fuscopaleaceum*, its montane form and of *Polystichum pungens*.

PRE *10246*; Pilgrims Rest, *Collins 895c*; Woodbush, *Jenkins 919c*; Sabie, *Wager 48*; Duiwelskloof, *Scheepers 419*; Natal, PRE *2168*; Zwartkop, Natal, *Sim*, PRE *388*; Drakensberg, *Esterhuyzen 26045*; Lion's River, Natal, *Moll 829*; Cathedral Peak, *Killick 1134* and *981* (identified by the collector as *P. setiferum* (Forsk.) Woynar); Natal, *Wood*, coll. *Sim 520c*; Van Reenen, *Schlechter 42c*; Lidgetton, Natal, *Roberts 87f*; Underberg, Natal, *MacClean 684*; Tugela Gorge, *Hutchinson 41*; Lesotho, *Dieterlen 695* and *1309*; Pirie, East. Province, *Sim* PRE *3642*; Compassberg, *Acocks 23447*.

While the typical form in most instances loses its indusia at a relatively early stage, although relics may often be preserved, a montane and southern form of the species is characterised by the retention of the indusia well into the mature state. The author refers to this form as the *Drakensberg Form* of the species. *Doidge 1061* at PRE shows clearly that the initial stage of the development of the sori commences with the typical flat, disc-like, colourless, erose indusia of the typical form of *P. setiferum* var. *fuscoplaeaceum*. The indusia later become mushroom shaped or slightly funnel-shaped, changing their colour from pale yellow to yellow and reddish-brown, at which stage the likewise reddish-brown sporangia protrude around the margins. Finally the indusia become drawn into the sori which often have tufty white paraphyses. When the sporangia have fallen off an elongated black scar is left along the veins of the pinnules.

The Drakensberg Form is even more densely set with scales than the typical form, having a heavy coat of ovate-lanceolate light-brown to foxy-red scales on rhizome and lower stipe, 12 × 5 mm in size, with darker brown centre stripe and translucent lighter brown edges. The scales on the rhachis are filiform, foxy red, up to 6 mm long. The frond is narrowly lanceolate, with closely set acuminate pinnae and overlapping pinnules, set at 60 ° to 90 ° to the costae, but mostly still revealing the characteristic 90 ° angle in places.

The persistence of the indusia, the dense cloth of scales and the closely set pinnae and pinnules point to an adaptation to colder climatic conditions, but may also be caused by growth in more exposed, less shady habitats which prevail in the range of distribution of the Drakensberg Form at altitudes from about 1 700 m in the southwestern and southern Cape to more than 2 760 m in the Drakensberg. Specimens have been collected in an area extending from the Hex River Mountains in the southwestern Cape towards the Compassberg and the high portions of the northeastern Cape Province, the Orange Free State, Lesotho and Natal and northwards as far as Wakkerstroom in the southeastern Transvaal (see Fig. 11).

The following gatherings have been made:

PRE—Oshoek, Wakkerstroom District, *Devenish 2538* and *195*; Thaba N'chu Mountain, O.F.S., *Roberts 2998;* Clarence, O.F.S., *van Hoepen 18230;* Mt. Aux Sources, *Bottomley*, PRE *2497;* Goodoo, Mt. Aux Sources, *Doidge 1061;* Drakensberg National Park, *Hafstroem & Acocks 1966;* Cathedral Peak, Drakensberg, *Killick 981* (identified by the collector as *P. setiferum* (Forsk.) Woynar); Giant's Castle, *Snyman 1281;* Cathedral Peak, *Rush 2030* and *2300;* Gudu Forest, Natal National Park, *Edwards 325;* Lesotho, *Schmitz 402* (identified by the collector as *P. setiferum* (Forsk.) Woynar); Lesotho, *Guillarmod 690*; Lesotho, *Bevis 102;* Molteno, *Flanagan 1681;* Top of Mt. Koudveld, *Herb. Marlothianum* PRE *2170;* Highbury, Polela District, Natal, *Doidge* PRE *9*; Barkley East, *Galpin 6934*; Matatiele, *Acocks 12207*; Queenstown, Hangklip Mountain, *Roberts 2012*; Compassberg, *Coetzee* PRE *11456;* Montague Pass, *Schweickerdt* PRE *4705;* Hex River Mountains, *Esterhuysen 14885.*

Polystichum pungens sensu Sim in Ferns S. Afr. 2. ed.: 116, t.27 (1915); *Aspidium aculeatum* Sim in Kaffr. Ferns 46 (pro parte) (1891); *Aspidium aculeatum* var. *pungens* sensu Sim in Ferns S. Afr. 1. ed.: 166 (1892).

This fern is generally referred to in the South African literature (for instance Schelpe, 1952) and herbaria as *P. lucidum* (Burm.) Becherer. The type of this

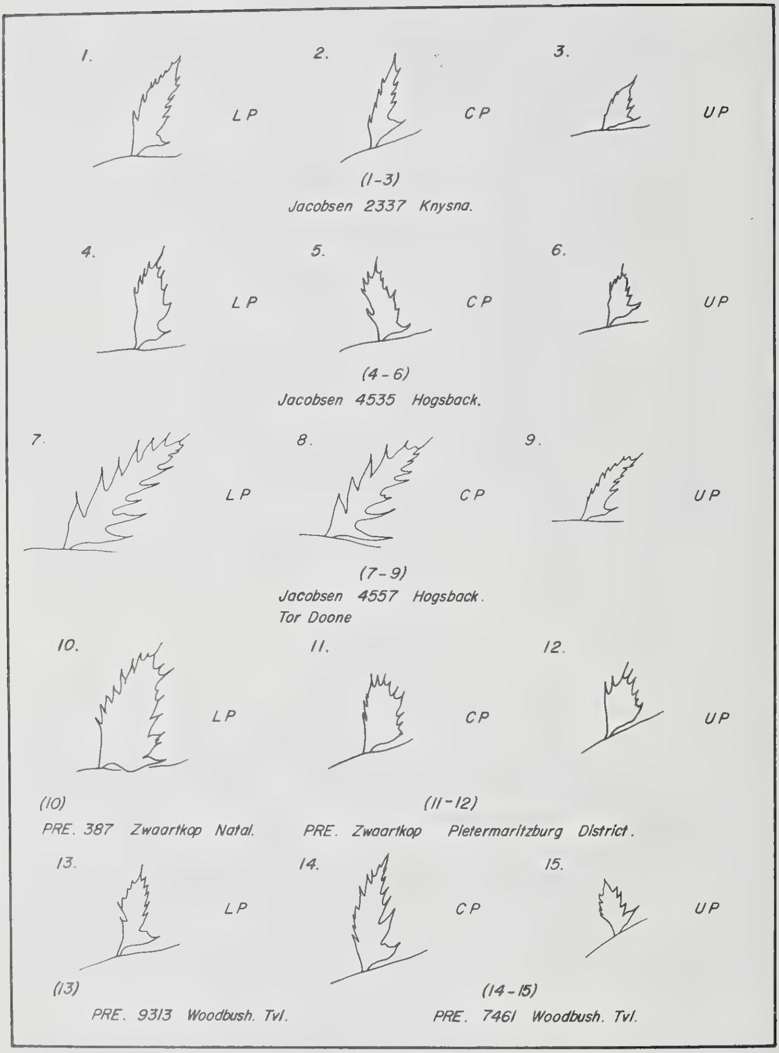


FIG. 9.

Polystichum pungens. Variations in size and shape of acroscopic pinnules. Note the strongly deviating Natal and Tor Doone forms. Natural size. Abbreviations as for Fig. 7.

plant, named *Asplenium lucidum* by Burmann fil. is in Geneva and Becherer gave only a very brief description of it. *Aspidium pungens* Kaulf. was based on a specimen collected by Chamisso in the Cape and is now in Leningrad. As the author is not able to examine either of the types and to avoid confusion as to the plant referred to, it is here quoted as *Polystichum pungens* sensu Sim.

In his description Sim mentions that this fern has given rise to much confusion in the past due to its extreme variability, especially in the size and shape of its pinnules of which Fig. 9 tries to convey an impression. This could possibly lead to the subdivision into a number of forms or even varieties. The author, however, is of the opinion that the varying characteristics are on the whole impersistent in distribution and nature, with the exception of a montane form which will be discussed below.

One of the safest ways of distinguishing *P. pungens* from *P. setiferum* var. *fuscopaleaceum* and *P. transkeiense* in the dried state is the colour, which with *P. pungens* invariably turns blackish or dark olive-green on the upper side and silvery- to olive-grey on the underside. The indusia are practically persistent, peltate, stalked, funnel-shaped, initially colourless to light brown, later dark brown, often with a dark centre, only drawn into the sori at a late stage. The sporangia are brown with a light to dark brown annulus.

The pinnules are strongly varying in size, 13–30 mm long, 6–10 mm wide at the base, their shape varying from non-lobate forms (Natal and Katberg) to strongly subdivided lobate forms (Tor Doone, Hogsback area) as Fig. 9 demonstrates. The typical and most common form of the Cape (Fig. 6, A) has hard, leathery laminae with sharply aculeate pinnule lobes and a heavy coat of yellow-brown to reddish-brown scales on rhizome and lower stipe, which extends to the full length in young fronds. The less typical forms of Natal and Transvaal are not as leathery and more herbaceous.

P. pungens occupies on the whole slightly lower altitudes in the Cape and Natal than *P. setiferum* var. *fuscopaleaceum*. In the Transvaal the fern becomes much less common and is found sporadically in the forests of the eastern Transvaal as far north as the Woodbush. *P. pungens* is the most common fern in the southern Cape and the forests of Kaffraria and assumes in this respect the role which further north is taken up by *Dryopteris inaequalis*. Here it usually forms large clusters, often fully exposed to sunlight above the forests and on top of mountains amongst stones.

The typical form is represented by a great number of specimens:

Author: Mount Sheba, Transvaal, *Jacobsen 4433;* Hogsback, *Jacobsen 4535, 4553, 4557* (Tor Doone form); Storms River, *Jacobsen 2331;* Knysna, *Jacobsen 2337;* George, *Jacobsen 2314, 2292, 2317, 2319.*

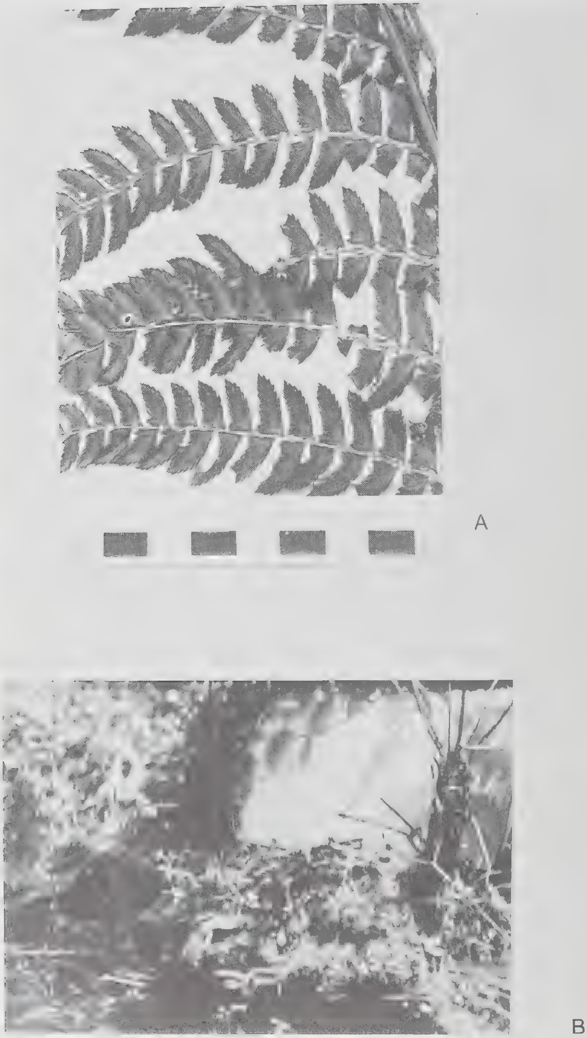


FIG. 6.

A, *Polystichum pungens* sensu Sim. Right centre pinnae. Note the oblong, falcate, sharply serrate-aristate pinnules. Woodville Forest Reserve, Wilderness, Cape, *Jacobsen 2314*. Scale in cm; B, *Athyrium scandicinum* (Willd.) Presl. Caudex, 15 cm high. Mount Sheba Nature Reserve, Pilgrims Rest District, Eastern Transvaal.

PRE—TRANSVAAL: De Hoek Forestry Reserve, *Schweickerdt* PRE *4689;* Woodbush, De Hoek, *Schweickerdt 1852c;* Woodbush, *Wager* PRE *7461;* Woodbush, *Jenkins 919.*
NATAL: Ngoya, Zululand, *Medley-Wood 10886* (pinnae undivided, hardly aristate); Zwartkop, *Sim* PRE *3560, 387, 11026, 9259;* Drakensberg, *Bottomley* PRE *5018;* Pietermaritzburg, *Strey 8429* (Tor Doone form); Maritzburg, *Sanderson,* coll. *Sim 530c* (Tor Doone form); Eshowe, *Laura* PRE *6421;* Winterskloof, *Doidge* PRE *54* (Katberg form).
TRANSKEI AND CAPE: Port St. Johns, *Wager* PRE 2996; Engcobo, Tembuland, *McLoughlin 1045c;* Kentani, *Pegler 270* (pinnules rather broad, sharply serrate-aristate); Komgha, *Flanagan 290;* Hogsback, *Dahlstrand 1550, 1853;* Pirie, *Sim* PRE *3554;* Pirie, *Sim 533c, 515c* (with foxy-red rhizome, stipe and rhachis scales); Pirie, *Sim 516c* (very broad pinnules, but distinctly aculeate and drying black on upper side); Mount Kemp, Pirie, *Sim 528c;* Pirie, *Sim* PRE *3559;* Dohne Hill, *Sim 512c, 513c;* Keiskammahoek, *Wells 3343;* Amabele District, *Hardcastle 293* (small form, with broad, poorly divided pinnules); Frankfort, *Sim 512c;* Katberg, *Young,* coll. *Sim 518c* (with broadly rhomboidal, rectangular based, poorly divided, but strongly aristate pinnules); Zuurberg, *Rogers 1478c;* Albany District, *Cooper* PRE *1161, 1415;* Great Winterhoek, Uitenhage, *Esterhuysen* PRE *10847;* Storms River, *Dahlstrand 1693;* Storms River, *Schlechter 5963;* Knysna, *Marloth 5711;* Knysna, *Rex 840c, 838c* (Tor Doone form, with dense foxy-red scales on rhachis); Plettenberg Bay, *Rodin 1191;* George, *Schlechter 525;* Wilderness, *Mogg 11636*; Ladysmith, *Esterhuysen 14013*; Hofmansbosch, *Britten* PRE *4241;* Cape Town, *Marloth 541* (very large pinnules, sharply serrate, aristate); Table Mountain, *Esterhuysen 15355* (Tor Doone form).

Similar to *P. setiferum* var. *fuscopaleaceum, P. pungens* has developed a high altitude *montane form* which may be distinguished from the typical form by the almost total lack of scales on rhachis, costae and costulae. The lower part of the stipe bears a cloth of dark reddish-brown linear to lanceolate scales. The texture of the lamina is thick and leathery, drying in contrast to the typical form to a fairly even matt olive-green on both sides. The pinnules may be aculeate, but are more often only coarsely serrate without the usual bristle points of the common form.

Representative specimens are:

PRE—Tabanhlope Mountain, Natal, *Wisch 184;* Tugela Valley, *Hafstroem & Acocks 1970;* Mont Aux Sources, *Schweickerdt 760;* Cathedral Peak, *Esterhuysen 10199a;* Cathedral Peak, *Edwards 851;* Rockeries Pass, Drakensberg, *Edwards 2145;* Golden Gate Highlands Park, O.F.S., *Liebenberg 7498.*

The Dryopteris inaequalis *Complex.*

Schelpe (1970, p. 221) describes *Dryopteris inaequalis* (Schlechtendal) Kuntze as a fairly large fern with creeping rhizome, large pale brown rhizome scales, a long stipe, a large, broadly to narrowly ovate, triangular, two-pinnatifid lamina with the basal pinnae hardly or not reduced. While this description fits the most common forest fern in Southern Africa, the author observed and collected a similar, but much smaller fern in various forest localities which differs from *D. inaequalis* sensu Schelpe in its present concept by its non-triangular, broadly lanceolate frond and its distinctly reduced basal pinnae. While the large fern is usually 3- to 4-pinnatifid (not always 2-pinnatifid as Schelpe's description of the Rhodesian form confusingly seems to convey), the small fern is never more than 2-pinnate to 3-pinnatifid. Its characteristics seem to agree well with the description of *Dryopteris inaequalis* sensu Sim (1915, p. 106, t.18); while the characteristics of Schelpe's *D. inaequalis* are coinciding with *D. elongata* sensu Sim (1915, p. 104, t.7). The history of the synonymy of the two species seems to contain a certain amount of confusion until 1964, as Table 1 demonstrates.

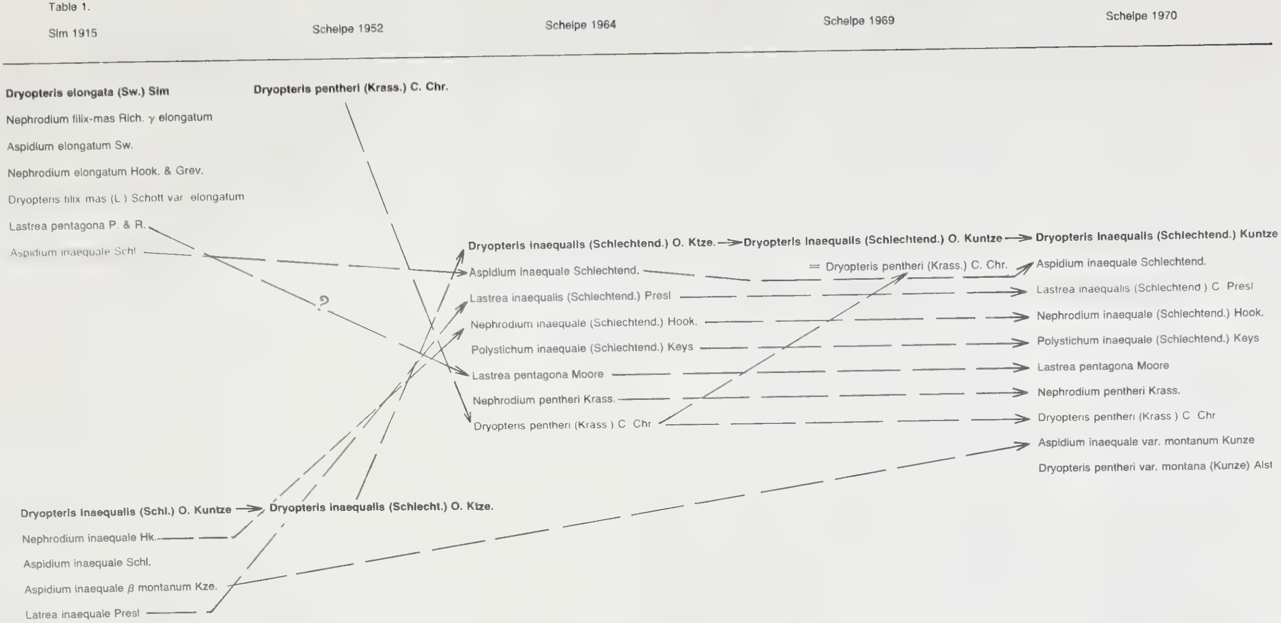
It is obvious that Schelpe in his later publications, combined the two species in one which he considered to be *D. inaequalis* (Schlechtend.) Kuntze, thus disregarding that this name referred to the small and relatively rare species of Sim (1915) and that *D. elongata* sensu Sim, corresponded with the common large forest fern. He must have come to the conclusion that the two species were not sufficiently distinct to be separated. Sim admits that there may be confusion between the two species when young. This was also observed by Burtt-Davy (1926) and the author. But in all instances where adult material is present, the distinction is easy. The author collected the small species in the Wilderness and the Hogsback and Pirie Forests. It is clearly distinct from the tall, triangular fronds of the common large fern by its very pronounced creeping and unusually thick (for such small fern) rhizome, its lanceolate fronds with widely separated pinnae, of which the basal pair is always smaller than the one above (Fig. 1, D), thus contrasting sharply with the distinctly triangular fronds of the larger fern, where the lowermost pinnae are always the largest. The author also had no difficulty in separating the relatively few specimens of the smaller fern from the several hundred specimens of the *D. inaequalis* complex at PRE, provided the entire frond and possibly the rhizome are preserved.

The following specimens were recognised to belong to this type:

Author: Hogsback, *Jacobsen 4576, 4571;* Pirie, *Jacobsen 4584;* George, *Jacobsen 2318.*

PRE—Mooi River, Natal, *Mogg 2160;* Zwartkop, Natal, *Sim* PRE *3624;* Frankfort, Cape, *Sim 480c;* Pirie, *Sim 469c;* Wilderness, *Mogg 11775;* Keiskammahoek, *Kotsokoane 246;* Woodvale Forest, Queenstown District, *Galpin 8202* (determined by Schelpe as *D. inaequalis* (Schl.) O. Ktze. and thought to be intermediate with *D. elongata);* Ravine, 9½ miles up Kowie River, *Bosman* PRE *2968;* sine loc., PRE *2295*; sine loc., *Wells 3339*; Kookfontein, *Burger 961c.*

Table 1.


Sim 1915
Schelpe 1952
Schelpe 1964
Schelpe 1969
Schelpe 1970
Dryopteris elongata (Sw.) Sim
Nephrodium filix-mas Rich. γ elongatum
Aspidium elongatum Sw.
Nephrodium elongatum Hook. & Grev.
Dryopteris filix mas (L.) Schott var. elongatum
Lastrea pentagona P. & R.
Aspidium inaequale Schl.
Dryopteris inaequalis (Schl.) O. Kuntze
Nephrodium inaequale Hk.
Aspidium inaequale Schl.
Aspidium inaequale β montanum Kze.
Latrea inaequale Presl
Dryopteris pentheri (Krass.) C. Chr.
Dryopteris inaequalis (Schlecht.) O. Ktze.
?
Dryopteris inaequalis (Schlechtend.) O. Ktze.
Aspidium inaequale Schlechtend.
Lastrea inaequalis (Schlechtend.) Presl
Nephrodium inaequale (Schlechtend.) Hook.
Polystichum inaequale (Schlechtend.) Keys
Lastrea pentagona Moore
Nephrodium pentheri Krass.
Dryopteris pentheri (Krass.) C. Chr
Dryopteris inaequalis (Schlechtend.) O. Kuntze
= Dryopteris pentheri (Krass.) C. Chr.
Dryopteris inaequalis (Schlechtend.) Kuntze
Aspidium inaequale Schlechtend.
Lastrea inaequalis (Schlechtend.) C. Presl
Nephrodium inaequale (Schlechtend.) Hook.
Polystichum inaequale (Schlechtend.) Keys
Lastrea pentagona Moore
Nephrodium pentheri Krass.
Dryopteris pentheri (Krass.) C. Chr
Aspidium inaequale var. montanum Kunze
Dryopteris pentheri var. montana (Kunze) Alst

It appears therefore, as if the re-institution of the previous subdivision into two different types may be justified, and that a clarification of the nomenclature and status of the two forms is called for.

The distribution of the smaller fern is quite interesting as it seems to be confined to a relatively low altitude belt, extending from the Wilderness over the forests of the Eastern Cape Province to Natal. Sim, in addition, quotes it from the Swellendam area, which appears feasible, but also from the Northern Transvaal (Woodbush) and Rhodesia as well as Mozambique. There are, however, no records from these areas at PRE. The altitude seems confined to the span from sea level to 1 220 m. The habitat requirements are deep shade, either in herbless ravines and gullies or, as frequently in the Hogsback and Pirie Forests, under a dense herb layer and then extremely difficult to find. The plant may therefore not be as rare as stated, but merely overlooked. The large form is common on forest floors throughout Southern Africa, but is also found in fairly open ground, at forest edges or on granite hills in Rhodesia, in which instances the pinnule lobes tend to become narrower and the pinnae are slightly wider spaced.

Athyrium scandicinum (Willd.) Presl

Schelpe, *Flora Zambesiaca,* 1970, uses as one of the distinguishing features between the genera *Athyrium* and *Diplazium* the absence, respectively presence of a caudex. Although in most instances applicable it was found that *Athyrium scandicinum* may develop a distinct caudex (Fig. 6, B). The author saw this species in the Mount Sheba Nature Reserve, Pilgrims Rest District, in a streambed on the so-called "Sheba Trail", shortly before this emerges from the forest into open grassland. About four or five specimens are growing here in a cluster on large boulders of quartzite, having caudices from 50 to 150 mm height from which large tufted fronds of about 600 mm length and 230 mm width emerge. The caudices are between 30 and 40 mm thick. The thick erect rhizome or caudex and the merely slightly incised pinnule lobes identify the species as *A. scandicinum,* as the similar *A. schimperi* has a creeping rhizome and strongly and deeply incised pinnule lobes.

References to this unusual habitus could not be found in the corresponding literature. Sim (1915) speaks merely of a suberect paleaceous crown. Tardieu-Blot (1958) quotes an erect rhizome and tufted fronds. More precise statements are found in Schelpe (1970): "Rhizome up to 5 mm in diameter, erect, with tufted fronds and oblong etc. rhizome scales". Yet in 1956 Schelpe collected his No. *6002* (PRE) at Entabeni in the Zoutpansberg with the annotation "Rhizome erect and massive". This is apparently a similar tall specimen with fronds of 650 mm length and approximately 300 mm width. From the use of the expression "massive" the author concludes that this may well have been a plant with a small caudex. Schelpe's key in *Flora Zambesiaca*, therefore, may thus be restricted to tropical Africa (Rhodesia, Malawi, Mozambique), but loses its validity further south. This geographical restriction seems to point to the possibility that the development of a caudex by *A. scandicinum* may be due to climatic factors and may take place only in the cool to cold montane forests of the Transvaal and possibly further south? The species extends in its distribution to Natal, but here usually at lower altitudes. Sim (1915) reports it also from Grahamstown and from Lesotho. Specimens from the latter locality might be interesting, but are unfortunately not represented at PRE.

ACKNOWLEDGEMENTS

The author wishes to express his sincere appreciation and thanks for the valuable assistance received from the Director of the Botanical Research Institute, Pretoria, Dr. B. de Winter, as well as from Mr. P. Vorster, Botanist in charge of the Cryptogam Section of the same institute.

Thanks are also due to Prof. P. J. Robbertse of the University of Pretoria for permission to study herbarium material at the Department of Botany.

Finally, the author would like to thank the Directors of Nature Conservation in the Transvaal, Natal and the Cape Province for the permission to collect Pteridophyta at various periods through the last years and especially Mr. N. Jacobsen of the Department of Nature Conservation of the Transvaal who during his work in various Nature Reserves collected many interesting specimens for the author's use.

REFERENCES

ALSTON, A. H. G. and SCHELPE, E. A. C. L. E., 1952. An annotated check-list of the Pteridophyta of Southern Africa. *Jl S. Afr. Bot.* **18:** 153–176.

BAKER, J. G., 1887. *Handbook of the fern allies.* London.

BURTT-DAVY, J., 1926. *A manual of the flowering plants and ferns of the Transvaal with Swaziland, South Africa.* London.

PAPPE, L. and RAWSON, R. W., 1858. *Synopsis Filicum Africae Australis.* Cape Town.

SCHELPE, E. A. C. L. E., 1967. New taxa of Pteridophyta from South East Tropical Africa. *Bolm Soc. broteriana* Ser. 2, **41:** 203–217.

SCHELPE, E. A. C. L. E., 1969. A revised check-list of the Pteridophyta of Southern Africa. *Jl S. Afr. Bot.* **35** (2): 127–140.

SCHELPE, E. A. C. L. E., 1970. Pteridophyta. In: A. W. Exell and E. Launert, *Flora Zambesiaca.* London.

SCHLECHTENDAL, F. L. de, 1825–1832. *Adumbratio Filicum in Promontorio Bonae Spei Provenientum.* Berlin.

SIM, T. R., 1915. *The Ferns of South Africa.* 2nd ed. Cambridge.

TARDIEU-BLOT, M. L., 1958. Polypodiacées (sensu lato). In: H. Humbert, *Flore de Madagascar et des Comores.* Paris.

TARDIEU-BLOT, M. L., 1971. Lycopodiacées, Huperziacées. In: J. F. Leroy, *Flore de Madagascar et des Comores.* Paris.